Also they scarcely seem to have been the result of conscious invention. Geoffrey of Monmouth was apparently a man of good character and a Bishop of the church. His position, therefore, seems to render it improbable that he committed a complete literary forgery like that of George Psalmanazzar ; and if he did not, what was the origin of these tales?

I conjecture, although I have very little proof to offer, that it may have originated something in this way. The Welsh chieftains were all fond of poetry, and kept in their service bards to sing their praises and that of their ancestors. Long genealogies were spun out connecting them with the great of the olden time. The license of song and verse would naturally increase the facility of invention.

This poetry would gradually in an uncritical age become considered veritable history, and finally, clipped of its ornaments, be turned into sober prose, and make its appearance as authentic history. An enormous mass of Welsh poetry is, I believe, in existence, mostly unprinted, and it would be very interesting and instructive if some scholar learned in Welsh, and with access to the manuscripts, would examine if the legendary history of Britain did not originate in this manner.

The same causes would explain the legendary history of Scotland, the darkness of which is incomparably greater than that of England. Indeed, it seems to me that with the exceptions of the glimpses afforded by the occasional notices of English chroniclers, nothing definite is known until about the time of Edward I of England.

A long series of kings is given with the events of their reigns, yet no explanation is given of the change from a Celtic-speaking people to an English-speaking people, apparently about the year 1000 A. D. The lowlands of Scotland were a people who used Gaelic and were governed by kings with characteristic Celtic names of Macbeth, MacDuff, Duncan, Malcolm, and with institutions of the regular clan or tribal nature. But when the light of history becomes bright and clear, they speak a dialect of English, their institutions are of the feudal rather than the clan type—their kings and nobles have names either Teutonic or Norman in the etymology ; and yet of this great revolution there is not a word in history.

On Miocene Invertebrates from Virginia (With Plate).

By Otto Meyer, Ph.D.

(*Read before the American Philosophical Society, March 16, 1888.*)

Prof. J. J. Stevenson, of the University of New York, has collected a quantity of Miocene material near Yorktown, Va. In his collection there are quite a number of specimens of large species in fine preservation, like Mercenaria tridacnoides Lam. sp., Panopea reflexa Say, Ecphora

quadricostata Say sp., and others. He transmitted to me recently for examination some little shells and some sand adhering to some of these large shells, in which material the species enumerated below were found. Partly they are already known to occur in Yorktown, for their greater number, however, they are described from other localities of the Atlantic Miocene. A few forms are new or new to the American Tertiary.

Some of the determinations were made from the published descriptions and figures, but in many cases these are insufficient for a determination, especially as far as the smaller species are concerned. Therefore, frequently the type-specimens in the collection of the Academy of Natural Sciences were compared and especially the forms described by H. C. Lea, from Petersburg, Va.,* had to be studied. My thanks are due to the Curator in charge of the Academy, Prof. A. Heilprin, who enabled me to study a great number of fossil types. Besides, I am obliged to the Curator of Molluscs of the Academy, Mr. Geo. W. Tryon, Jr., who gave me the opportunity to compare recent material. †

It is here not attempted to give the ultimate names of all the enumerated species, for this would presuppose a nearly complete working up of the Atlantic Miocene palæontology, including a comparison with recent, Eocene and European forms. But the opportunity is used at least in some cases to unite species, which, in my opinion, are synonyms. The following list of smaller species from Yorktown, Va., will probably be increased considerably in future, as the quantity of examined sand was only a small one.

I. Species known from the Atlantic Miocene.

Lamellibranchiata.

Ostrea sp. (juv.)
Anomia Ruffini Conr.
Plicatula marginata Say.
Lima papyria Conr.
Pecten eboreus Conr.
Arca centenaria Say.
Arca carolinensis Conr.
Pectunculus lentiformis Conr.
Pectunculus subovatus Say.
Nucula diaphana H. C. Lea.
Leda acuta Conr.
(= Leda carinata H. C. Lea.)
Yoldia lævis Say sp.
Carditamera arata Conr.

* Transact. Amer. Philos. Soc., Vol. ix, pp. 229–274.

† Since the above was written, Science has lost a valuable worker in Mr. G. W. Tryon, Jr., whose death occurred on Feb. 5, 1888.

Venericardia granulata Say.
Venericardia tridentata Conr.
Astarte vicina Say.
Astarte undulata Say.
Crassatella undulata Say.
Gouldia lunulata Conr.
Chama congregata Conr.
Kellia lævis H. C. Lea sp.
Erycinella ovalis Conr.
Lepton mactroides Conr.
Diplodonta acclinis Conr.
Lucina crenulata Conr.
(= Lucina Leana d'Orb.)
(= Lucina lens H. C. Lea.)
Venus cortinaria Rogers.
Circe metastria Conr.
Tellina lusoria Say.
Tellina producta Conr.
Semele subovata Say sp.
Saxicava arctica Linné, var. bicristata Conr.*
Mactra modicella Conr.
Corbula cuneata Say.
(= Corbula inæqualis Say.)

Glossophora.

Dentalium attenuatum Say.
Cadulus thallus Conr. sp.
Chiton transenna H. C. Lea.
Fissurella catilliformis Rogers.
Adeorbis concava H. C. Lea sp.
(= Delphinula lipara H. C. Lea.)
Teinostoma subconica H. C. Lea sp.
Delphinula costulata H. C. Lea.
Trochus torquatus H. C. Lea.
(= Trochus Ruffini H. C. Lea.)
Trochus lens H. C. Lea.
(= Delphinula trochiformis H. C. Lea.)
Natica sphærulus H. C. Lea var.
Crucibulum grande Say.
(= Infundibulum concentricum H. C. Lea.)
Crepidula fornicata Lam.†

* See Proc. Acad. Nat. Sci. Phila., 1884, p. 108.

† Most of the species of Crepidula, described from the Atlantic Miocene, if not all of them, are apparently synonyms of this form. It is very variable and specimens of different age, shape and ornamentation have received specific names.

PROC. AMER. PHILOS. SOC. XXV. 127. R. PRINTED MAY 10, 1888.

Turritella terstriata Rogers.
Turritella quadristriata Rogers.
Turbonilla exarata H. C. Lea sp.
Turbonilla daedalea H. C. Lea sp.
Turbonilla eburnea H. C. Lea sp.
Turbonilla subula H. C. Lea sp.
Odostomia granulata H. C. Lea sp.
Eulima eborea Conr.
(= Pasithea lævigata H. C. Lea.)
Cerithiopsis clavulus H. C. Lea sp.*
(= Cerithium annulatum Emmons.)
Oliva ancillariæformis H. C. Lea.
Tornatina Wetherilli J. Lea sp.
(= Tornatina cylindrica Emmons.)
Bulla subspissa Conr.

Balanus concavus Bronn.

A tergum of a Lepadide, apparently of Scalpellum magnum Wood, Darwin, unfortunately was lost, together with a very minute specimen of an Ostracod, Cythere sp. No species of an Ostracod has been found heretofore in the Atlantic Miocene. Scalpellum magnum,† however, has been found at Petersburg, Va., but misinterpreted. The carina has been described by H. C. Lea as Patella acinaces,‡ and the scutum as Avicula multangula,§ and these species appear in the Miocene lists of Conrad‖ and Meek.¶ Prof. A. Heilprin, in his list of Tertiary fossils from Virginia, also enumerates Patella acinaces,** while Avicula multangula is put among those species of H. C. Lea which are "based upon young shells, or upon such as barely admit of characterization. ††

As my opinion about these fossils differs so essentially from that of a number of authors, I consider it necessary to give the figures of the type-specimens in the collection of the Academy of Natural Sciences in Philadelphia (Fig. 11, 11*a*, 12, 12*a*), so that others may be able to form their own judgment. The original figures of H. C. Lea are not sufficient for this purpose.

* One of my specimens has three embryonic whorls preserved. They are smooth and this apparently shows that the species is not identical with the Eocene Cerithiopsis constricta H. C. Lea sp., although adult specimens without nucleus look alike. See Berichte d. Senckenberg. Naturf. Gesellsch., Frankfurt a. M., 1887, p. 8, Pl. 2, fig. 23; and see Proc. Acad. Nat. Sci. Phila., 1884, p. 105.

† Darwin, fossil Lepadidæ, p. 18, Pl. 1, fig. 1.

‡ Trans. Amer. Philos. Soc., Vol. ix, p. 247, Pl. 35, fig. 36.

§ *Ibid.*, p. 245, Pl. 35, fig. 31.

‖ Proc. Acad. Nat. Sci., 1862, p. 570, p. 579.

¶ Smithson. Miscell. Collect., 183, Nov. 1864, p. 14; p. 6.

** Contrib. to the Tertiary Geol. and Palæont. of the U. S., p. 57.

†† *Ibid.*, p. 48.

II. Species New to the American Tertiary.

Cœcum stevensoni n. sp. Figure 4.

Relatively large; regularly and well curved. Shell thick. Surface closely covered by strong longitudinal costæ, which are usually alternating. Septum mucronate.

If the shell is kept horizontal, its convexity towards the observer, the mucronation of the septum appears on the left side. Its size and position is variable, sometimes it is nearly marginal, sometimes subcentral. The costæ are usually broader than the interstices between them and alternating, but in some specimens they are nearly equal. The younger part of two specimens shows indications of rings, producing a very slight cancellation. There is a contraction at the aperture, but it is confined to the margin of the aperture and nearly imperceptible. Besides the regular form there occur smaller specimens of equal ornamentation, but different shape. They have a less cylindrical tube, the increase in width towards the aperture being much larger. The same small and tapering form occurs with the following species. Wood observed the same form occurring with the Crag species of Cæcum. He considered them at first as distinct species, and then described them as varieties (see Crag Mollusca, Vol. i, p. 116, Pl. 20, fig. 4*b*). I think they are the adolescent state of the species.

I have not become aware of a form of the European Tertiary, with which to compare C. stevensoni, and no costated Cæcum is known from the American Tertiary. Specimens of the recent Cæcum cooperi Smith were compared and proved to be somewhat similar, but specifically different. They have fewer and thinner ribs, are distinctly cancellate and have a different shape. C. stevensoni is quite common in Yorktown.

Cœcum virginianum n. sp. Fig. 3.

Relatively large; regularly but slightly curved. Shell thick. Septum prominent, angular. Surface smooth, with concentric striæ of growth.

The mucronation of the septum is situated and is variable, like in the preceding species. Specimens of the adolescent state have a more tapering form, as in the preceding species.

A similar European fossil is apparently Cæcum mammillatum Wood,* from the Crag; which, however, is more curved and has a less angular and more mammillated septum. About the differences with other smooth species of the American Tertiary see below. Similar recent species are apparently Cæcum chinense de Folin† and Cæcum læve Adams.‡ I have not been able to compare specimens of these two species. C. chinense, according to De Folin's figure, seems to be more slender and more tapering and the septum seems to be different. C. læve is described as shining and is apparently a shorter species.

* Wood, Crag Mollusca, Vol. i, p. 116, Pl. 20, fig. 4.

† De Folin, Fonds de la mer, Vol. i, p. 80, Pl. 9, fig 3-4.

‡ See Tryon's Manual of Conchology, Vol. viii, p. 215, Pl. 66, fig. 52.

Cæcum glabrum Montague var. Fig. 5.

Dentalium glabrum Mont., Testacea Britannica, p. 497.

Small ; regularly curved ; cylindrical surface smooth, shining. Septum not prominent, convex, very slightly mucronate.

Those specimens of the recent C. glabrum which I was able to compare had a septum as regularly curved as a watch glass and without any mucronation. The septum of the Yorktown specimens, however, though at first sight also regularly convex, shows at a closer examination in nearly all cases a slight mucronation, and for this reason I consider it necessary to call the Yorktown specimens a variety. The Crag species which Wood described as C. glabrum* resembles perhaps more to this Miocene form than to the recent one. C. glabrum is not rare in Yorktown.

The following is a brief review of the species of Cæcum known as yet from the American Tertiary :

Eocene.—1. Cæcum solitarium Mr.,† Vicksburg, Miss., of middle size, regular curvation, smooth surface and contracted at the aperture. 2. Cæcum alterum Mr.,‡ Jackson, Miss., similar to the preceding, but slightly annulated.

Miocene.—3. Cæcum annulatum Emmons,§ North Carolina. A specimen is in the collection of the Academy. It is very strongly annulated. 4. Cæcum stevensoni Mr., Yorktown, Va., coarsely costated. 5. Cæcum virginianum Mr., Yorktown, Va., smooth, large, thick, rather straight, septum prominent and angular. 6. Cæcum glabrum Mont. var., Yorktown, Va., smooth, small, thin, curved with flattened septum.

Pyramis promilium n. sp. Fig. 1.

Small, subulate. The dextral nucleus is followed by five adult whorls. They are somewhat convex, ornamented by revolving punctuate striæ, about four on each whorl. Base rounded, covered by similar striæ. Mouth oval. Inner lip with a small receding fold. Outer lip thin.

The figured specimen is not entirely adult and though not specifically different differs somewhat from the rest. It is less slender and the only one in which the punctuate nature of the revolving striæ can be distinctly recognized. The fold on the columella is hardly perceptible when the mouth is perfect, as in the type-specimen, but is more conspicuous in broken specimens.

While in the Yorktown material most of the small species described by H. C. Lea from Petersburg, Va., were found, Actæon milium H. C. Lea was not detected. But, as it were in place of it, above similar species occurs. At first sight Actæon milium seems to be very different, because it has a stout form and a stronger fold. The amount of slenderness, how-

* Crag Moll., Vol. i, p. 117, Pl. 20, fig. 6.
† Bull. i, Geol. Survey Ala., p. 68, Pl. 3, fig. 9.
‡ Ber. d. Senckenberg. Naturf. Gesellsch., 1887, p. 6, Pl. 1, fig. 8.
§ Emmons, Geology of North Carolina, p. 274, fig. 190.

ever, seems to be not quite constant, and the species are apparently allied. The only similar recent shell seems to be Pyramis striatula Couthouy* (= ? Menestho albula Fabr.), which form, however, is much larger and without visible fold, apart of other differences.

Turbonilla paucistriata ? Jeffreys. Fig. 2.

? Odostomia paucistriata Jeffreys ; Proc. Zoöl. Soc., London, 1884, p. 361; Pl. 27, fig. 6.†

The sinistral nucleus, which is twisted outwards, is followed by five adult whorls. They are flattened and covered by broad, flat, straight ribs, about fifteen on the last whorl. Suture impressed. Base rounded, smooth. Mouth pear-shaped. Outer lip thin.

The interstices between the ribs are mere furrows. On the younger whorls these furrows are not equal and not regularly arranged. Only two specimens were found, and they are, probably, not quite adult. The figured one has a volution less than the other, but a perfect mouth.

Turbonilla exarata H. C. Lea sp., of the same locality, is less slender, its whorls are more convex and the ribs are strong and obliquely set. Turbonilla subula H. C. Lea sp., of the same locality, is considerably stouter, has convex whorls and strong ribs. Turbonilla eburnea H. C. Lea sp., of the same locality, has sharply cut revolving striæ between the ribs. The form agrees with the description and figure of T. paucistriata Jeff., but I have not been able to compare specimens of this recent species and therefore am not entirely certain about this determination.

Astarte orbicularior n. sp. Fig. 6.

Shell, thick, flat. Suborbicular, umboneal margins more or less straightened, ventral margin rounded. Beak very small, medial. Lunule flat, lanceolate. Hinge broad, cardinal teeth strong. Muscular impressions suboval, about equal, anterior one with separate auxiliar. Margin entire. Surface smooth or with a few concentric undulations.

The species is flatter and more orbicular, than any one that has been described from the Atlantic Miocene. It is variable in form and young specimens are more convex, more trigonal, and the beak is turned more

* Boston Journ. Nat. Hist., ii, p. 101, Pl. 1, fig. 6, and Gould, Invert. Mass., p. 269, fig. 174.

† J. G. Jeffreys, On the Mullusca procured during the Lightning and Porcupine Expedition. On page 364 the genus Mathilda is placed in the Pyramidellidæ. I considered this position of Mathilda probable in the Berichte d. Senckenberg. Naturforsch. Gesellsch., 1887, p. 6, without having been aware, at that time, that Jeffreys pronounced the same idea in 1884.

On page 365, Pl. 27, fig. 10, Jeffrey's describes the new genus Gegania. I am not aware of any generic difference of this genus and Tuba J. Lea, and the recent Gegania pinguis Jeffreys, and the Eocene Tuba striata J. Lea (Contrib. to Geology, p. 128, Pl. 4, fig. 117) seem to be rather allied species.

distinctly anteriorly. They approach in their form Astarte coheni Conr.* and Astarte symmetrica Conr.† and indicate that the species has been derived from the usual trigonal form of Astarte. A similar recent shell, judging from the figure, seemed to be Astarte quadrans Gould,‡ but a comparison of specimens proved that there is no resemblance.

Leda pygmæa ? Muenster. Fig. 7, 7*a*.

?Nucula pygmæa Muenster, Goldfuss, Petref. German. Vol. ii, p. 157, Pl. 125, fig. 17.

Small ; triangularly ovate ; subequilateral. Without distinct lunule or corselet. Shell rather thick. Hinge broad, with about fourteen teeth altogether. Pallial sinus small. Surface smooth.

Only the figured specimen was found and no opportunity has yet been found to compare it with the German typical specimens. What Wood describes as Leda pygmæa Muenst. from the Crag§ has been separated by Weinkauff‖ from the German species and identified with the recent Leda tenuis Philippi.¶ It seems to have a thinner shell and more teeth than the German Oligocene form. The Yorktown specimen has a solid shell and relatively few teeth.

Modiolaria petagnæ Scacchi. Fig. 8.

Modiola Petagnæ Scacchi, Philippi, Enum. moll. Sic. Vol. ii, p. 51 ; Vol. i, Pl. 5, fig. 11.

Oblong ; ventricose ; angular posteriorly. Anterior side contracted, extending beyond the umbo. Anterior and posterior surface radiately ribbed, the ribs decreasing in size towards the middle and not existing on the middle. Whole surface moreover irregularly concentrically striated. The radiating ribs crenulate the inner margin. Inside somewhat nacreous.

Both the concentric and radiating ribs are not regularly arranged, taking their origin by bifurcation of other ribs. By the crossing of the ribs the anterior and especially the posterior surface appear cancellate.

The shell agrees with the Crag form, which Wood described as Modiola costulata Risso,** comparing it with the figure of Philippi in the Enumeratio molluscorum Siciliæ, Vol. i, p. 70, Pl. 5, fig. 11, referred by Philippi himself in Vol. ii, p. 51, to M. petagnæ Sc. But Wood considered M.

* Conrad, Mioc. Fossils, p. 43, Pl. 21, fig. 5.

† *Ibid.*, p. 44, Pl. 21, fig. 7. I have seen specimens labeled with Conrad's handwriting "Astarte coheni," but with entire margin, while he describes this species with crenulated margin, like A. symmetrica. Altogether I am not aware of any specific difference between the two forms, even if the margins should differ.

‡ Gould, Invert. Mass., p. 81, fig. 48.

§ Crag Moll., Vol. ii, p. 95, Pl. 10, fig. 11.

‖ Weinkauff, Conchilien d. Mittelmeeres, Vol. i, p. 211.

¶ Phil., Enum. Moll. Sic., Vol. i, p. 65, Pl. 5, fig. 9.

** Crag. Moll., p. 60, Pl. 8, fig. 6.

costulata and M. Petagnæ only as varieties of the same species. A comparison of specimens of the two recent forms, however, convinces me, that they are different, and this is apparently the general opinion. The Yorktown form agrees specifically with specimens of M. Petagnæ from Greece, and agrees in every detail with specimens of M. Petagnæ from the Canary islands. The recent M. lateralis Say, though generally stouter, is similar and perhaps might be united with M. Petagnæ.

Modiola phaseolina Philippi. Fig. 9.

Philippi, Enumer. mollusc. Sic., Vol. ii, p. 51, Pl. 15, fig. 14.

Nacreous. Oblong-ovate. Ventral margin straight or subsinuated, dorsal margin subangulated. The small cardinal area is finely striated and the interior part of the dorsal margin is minutely crenulated within. Surface with striæ of growth.

Modiola ducatelli Conr.* from the Atlantic Miocene is a large, elongated and flattened species of apparently very different form. The type and only specimen has only the outside exposed so that interior characters cannot be determined. More similar seems to be Modiola inflata Tuomey & Holmes.† But this species is founded on a single and incomplete impression and I am unable to determine its specific characters. The Yorktown specimens agree with Philippi's description and figure of M. phaseolina from the Crag‡ and with recent specimens from the coast of England.

Semele ? virginiana n. sp. Fig. 10, 10*a*.

Only the figured right valve of this form has been found. As the shell is solid, the adductors are well marked and the pallial line very strongly impressed, I think the specimen is adult, or at least adult enough to show its generic and specific characters. Its main peculiarity is the position of the cardinal teeth, which are not below the beak. Altogether I do not think that the shell can be properly placed into the genus Semele or any other existing genus, but it may be named this way until more material is found. It may be described in the following way.

Minute; compressed; not gaping. Subcuneiform, posterior side short, beak being rather terminal. Anterior margin regularly rounded, posterior margin truncate. Anterior muscular impression orbicular, sinuated anteriorly; posterior muscular impression elongated, sinuated posteriorly. Pallial sinus deep. Below the small beak there is a subquadrangular cartilage pit, anterior to which there is vertical and rather strong cardinal tooth. A second cardinal tooth adjoins it, which is obsolete, oblique and formed by a slight increase of the continuation of the anterior lateral tooth. Lateral teeth strong; the anterior one is long, the posterior one of

* Conrad, Mioc. Foss., p. 53, Pl. 28, fig. 2.
† Pliocene Foss. South Carolina, p. 33, Pl. 14, fig. 3.
‡ Crag Moll., p. 59, Pl. 8, fig. 4.

about half its length. Surface regularly, closely and strongly concentrically ribbed, the ribs disappearing near the umbo. Lunule small; indistinct.

Miliolina seminulum Linné sp.

One specimen has been found only and has been determined as above by Mr. A. Woodward, in New York. Though no foraminifera is mentioned in Meek's Miocene Check List (Smithsonian Miscellaneous Collections, 1864), J. Lea has described a species from the Miocene of Maryland as Miliola marylandica,* and it is very probable that this name is a synonym of above.

EXPLANATION OF PLATE.

Fig. 1.	Pyramis promilium n. sp.	Yorktown, Va.
" 2.	Turbonilla paucistriata ? Jeffreys.	" "
" 3.	Cæcum virginianum n. sp.	" "
" 4.	Cæcum stevensoni n. sp.	" "
" 5.	Cæcum glabrum Montague var.	" "
" 6.	Astarte orbicularior n. sp.	" "
" 7, 7a.	Leda pygmæa ? Muenster.	" "
" 8.	Modiolaria petagnæ Scacchi.	" "
" 9.	Modiola phaseolina Philippi.	" "
" 10, 10a.	Semele ? virginiana n. sp.	" "
" 11, 11a.	Carina of Scalpellum magnum. (type of Patella acinaces H. C. Lea.)	Petersburg, Va.
" 12, 12a.	Scutum of Scalpellum magnum. (type of Avicula multangula H. C. Lea.)	" "

On some Possible Methods for the Preparation of Gramophone and Telephone Records. By *Prof. Edwin J. Houston.*

(*Read before the American Philosophical Society, April 20, 1888.*)

Phonograph records, of the type employed by Mr. Berliner in his gramophone, *i. e.*, those obtained by causing the point or stylus attached to the vibrating diaphragm to move parallel to the recording-surface instead of perpendicular thereto, can be prepared more readily, and by a greater variety of methods, than is possible with record-surfaces of the old forms.

In a study of the later forms of phonographic apparatus, several methods of preparing gramophone plates have suggested themselves to the author, which he hopes soon to be able to put to the test of actual trial. These methods, though particularly applicable to records horizontally traced,

* Contrib. to Geology, p. 215, Pl. 6, fig. 227.